20-21-22 MARS

PALAIS DES CONGRÈS
PORTE MAILLOT - PARIS

2013

IRC

INTERNATIONAL RUBBER CONFERENCE

IRC International Rubber Conference Organisation

AFICEP

dgcis direction générale de la compétitivité de l'industrie et des services

Programme

www.irc2013.com

AFTERNOON : PARALLEL SESSIONS / APRÈS-MIDI : SESSIONS PARALLÈLES

	THEME 2 PROCESSING, OPTIMIZATION OF PROCESSES TECHNIQUES DE TRANSFORMATION ET OPTIMISATION DES PROCEDES	THEME 1 CHEMICALS ASPECTS AND RAW MATERIALS ASPECTS CHIMIQUES, MATIERES PREMIERES ET FORMULATION
14.00 - 14.40	**Guest speaker / Conférencier invité** **Prof.Dr.-Ing.Andreas LIMPER, Member of the Management Board, HARBURG-FREUDENBERGER Maschinenbau GmbH, (Germany)** **New angles in mixing of rubber compounds**	**Guest speaker / Conférencier invité** **Dr. Luca GIANNINI** **Nanofiller Project Leader, PIRELLI TYRE, (Italia)** **A Rubber Vision of High Aspect Ratio Nanofillers**
14.40- 15.00	Rheological behavior of NR by LAOS analysis in relation with postharvest and processing parameters **F. DEME - LRCCP** **J. SAINTE-BEUVE - CIRAD (France)**	New material solutions for harsher sevice conditions of automotive hose **S. BOUVIER - DUPONT PERFORMANCE POLYMERS (Suisse)**
15.00- 15.20	Efficience énergétique & réduction des pertes matière lors de la fabrication des articles moulés en caoutchouc **J-L. MAIRE - DESMA ELASTOMERTECHNIK (Germany)**	Synthesis of telechelic polyisoprenic oligomers by cross-metathesis reaction from natural or synthetic rubber **A. NOURRY - UNIVERSITE DU MAINE (France)**
15.20 - 15.40	Industrial compoundings of elastomers with nanofillers **M. CHARMAN - EMAC (France)**	Modified SSBR for Silica & Carbon Black Containing Tires **S.THIELE - STYRON EUROPE GMBH (Germany)**
15.40 - 16.00	Continuous rubber recycling using a co-rotating twin screw extruder **A. GALLO - F.LLI MARIS (Italia)**	Noxtite® High Performance High Temperature Acrylate Rubbers (HT-ACM) Improved media resistance in fuels and new highly addivated engine and transmission oils - A comprehensive study **K. ZOUMIS - UNIMATEC CHEMICALS EUROPE (Germany)**
16.00 - 16.20	Pause and visit of the exhibition	Novel polyurethane foams based on hydroxytelechelic oligomers of natural rubber **T. K. N. TRAN - UNIVERSITE DU MAINE - (France)**
16.20 - 16.40	Elastomer network investigation by solid NMR **B. GABRIELLE - E. GOMEZ - HUTCHINSON (France)**	Pause and visit of the exhibition
16.40 - 17.00	Rubber to metal bonded assemblies Characterization of the adhesion for different formulas of elastomers, metals and bonding agents. Correlation between kinetic crosslinking of rubber compounds and bonding agents **F. BRUNO - LRCCP (France)**	Identification des facteurs de variabilité du caoutchouc naturel pour développer des nouveaux grades à variabilité réduite et contrôlée destinés aux applications antivibratoires - Projet collaboratif CANAOPT **J. SAINTE-BEUVE - CIRAD** **J-F. PILARD - UNIVERSITE DU MAINE (France)**
17.00 - 17.20	How to reduce fatigue life dispersion starting from the study of 3D distribution of ZnO agglomerates by computed X-ray microtomography **K. LE GORJU - HUTCHINSON (France)**	HT-ACM XP - The Winning Combination of Processing and Performance for High-Temperature, Oil Resistant Hose **P. ABRAHAM - ZEON CHEMICALS EUROPE (England)**
17.20 - 17.40	Electron Beam Irradiated Natural Rubber-Polyaniline Dodecylbenzenesulfonate Blends **Y. KOK-CHONG - MALAYSIAN RUBBER BOARD (Malaysia)**	GUAYULE / HEVEA latex glove comparison **S. PALU - CIRAD (France)** **M.DORGET-CTTM (France)** **D.GUERIN-PIERCAN (France)**

GUAYULE / HEVEA latex glove comparison

M. DORGET,	CTTM
A.AMOR,	CTTM/CIRAD
S. PALU,	CIRAD
D.PIOCH	CIRAD
E.TARDAN,	CIRAD
D. GUERIN,	PIERCAN
C.MOURTON–GILLES,	ANSM

Hevea plantation,

Guayule field , Spain (El Molinar)

WHY AN ALTERNATIVE SOURCE OF NR SUPPLY ?

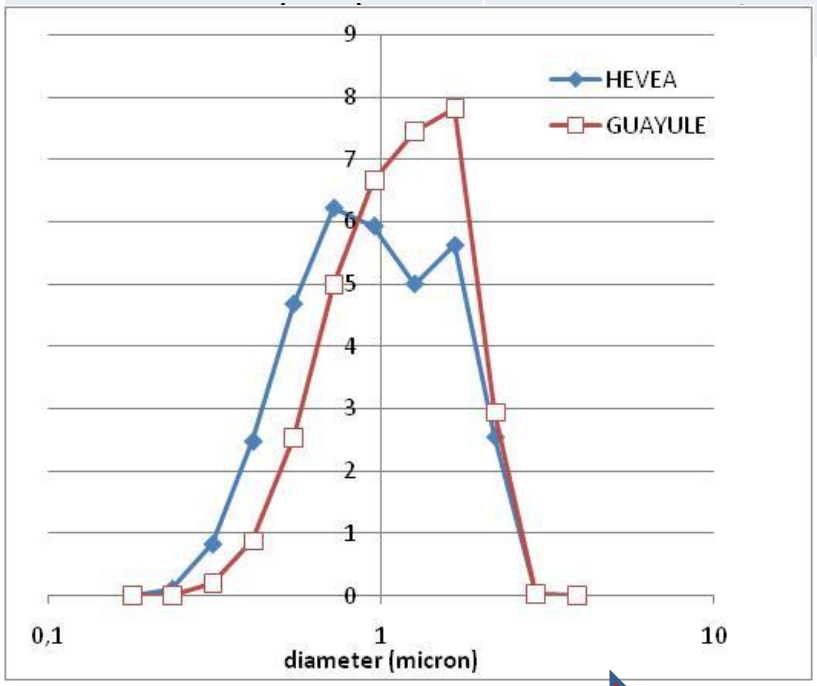
- ***HEVEA*, only commercial source of NR (93% of world production in Asia),**
- **Growing demand from emerging countries (China, India, Brazil),**
- **NR prices have rocketed upward,**
- **Threat by M*icrocyclus ulei* (SALB) (only in South America). The risk to spray in Asia/Africa exists. When ? How ?**
- **Price of NR and SR linked with oil (Brent), volatile price**

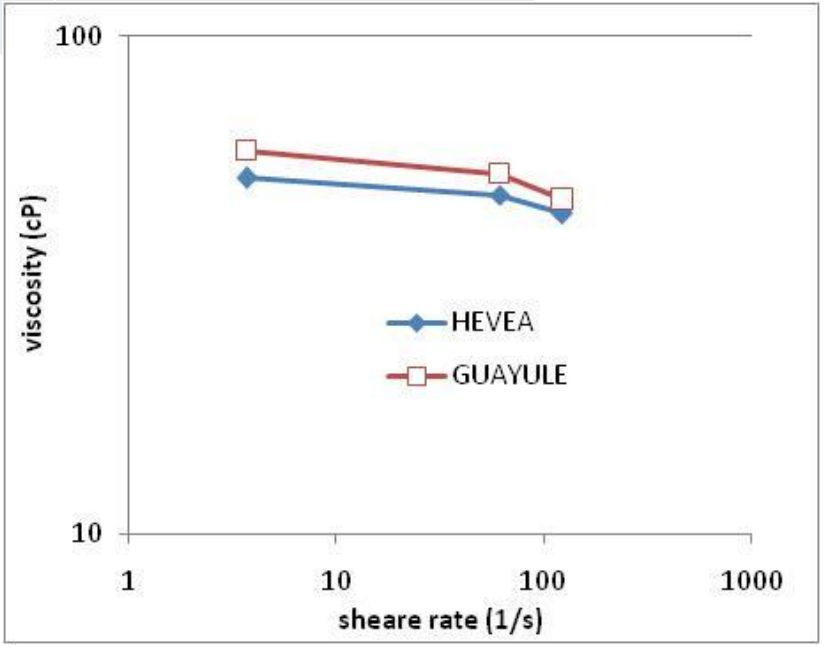
WHY AN ALTERNATIVE SOURCE OF NR SUPPLY ?

- **Proteins in Hevea latex cause life-threatening, IgE-latex allergy. Guayule latex hypoallergenic,**
- **Tendency for replacement rubber plantations by palm oil plantations,**
- **World climatic changes, more frequent weather woes.**
- **Rubber tapping laborious, social aspects (NGO), Guayule can be mechanized,**
-
- **Hevea, Guayule, TKS, Polyisoprene cis 1-4, High Mw,**

LATEX PROPERTIES

	HEVEA latex	Commercial GUAYULE latex
Solid content (%)	**61.4**	**55.6**
Viscosity (Cp)	**48**	**53**
pH	**9.6**	**10.9**





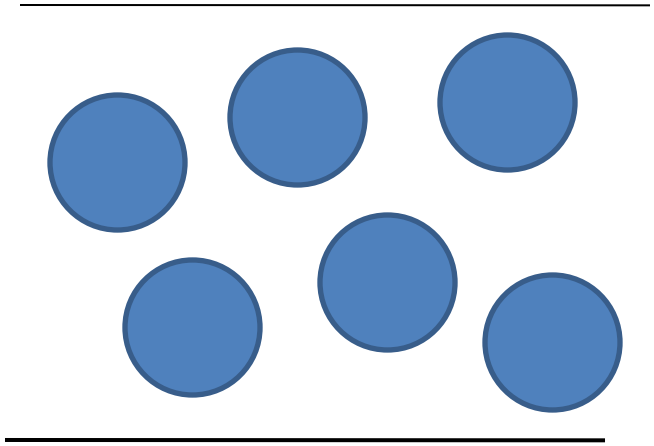
Similar wet characteristics

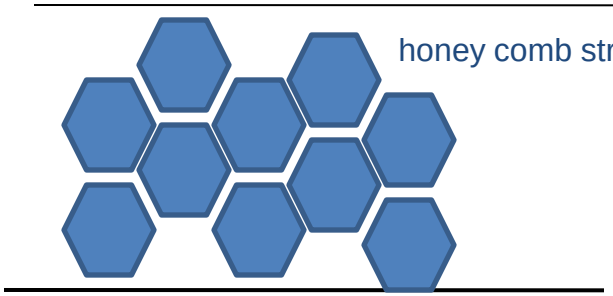
DRY CHARACTERISATION

drying procedure :

- 2 weeks at ambient condition
- 2h. at 110°C

1. concentration
2. deformation
3. coalescence

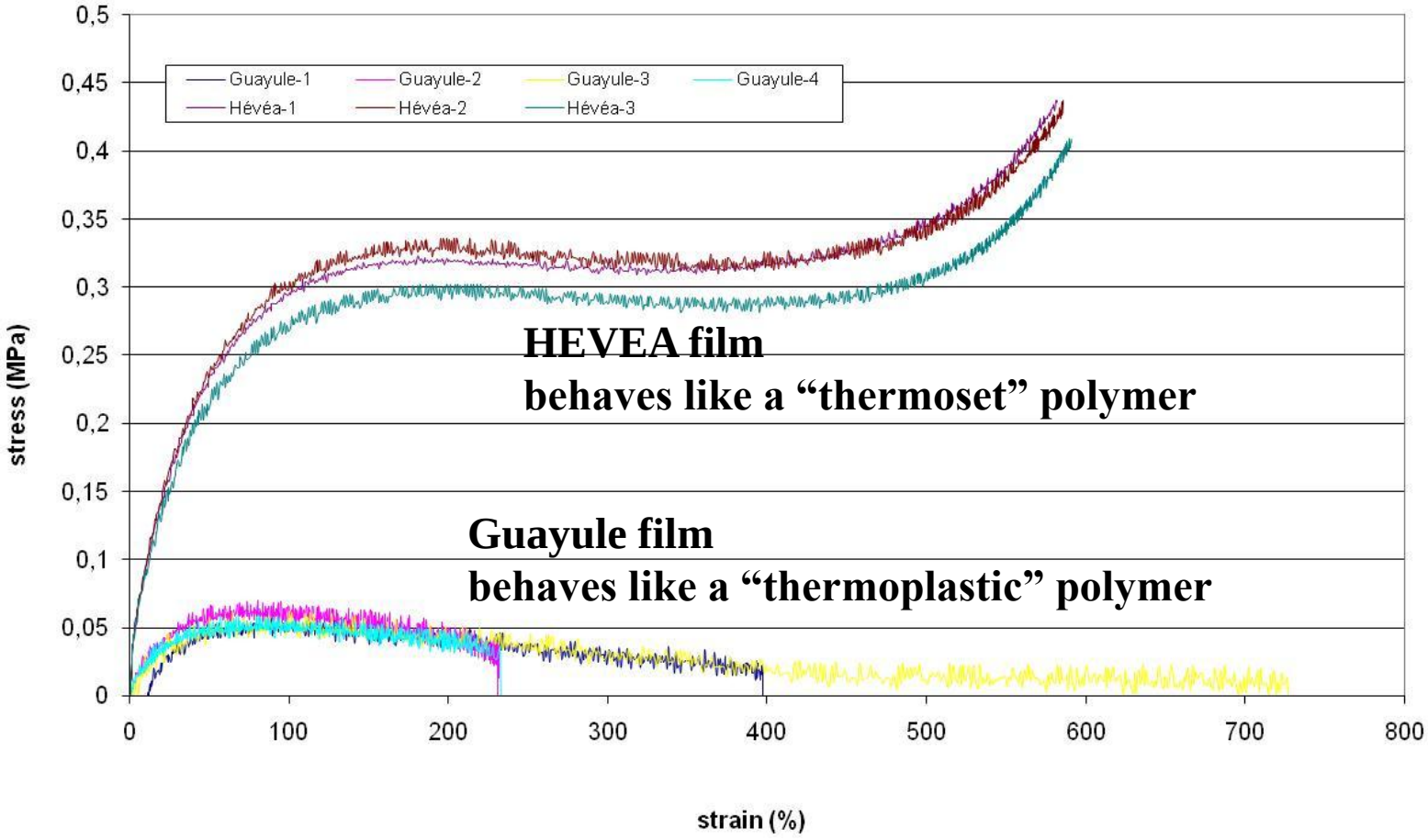




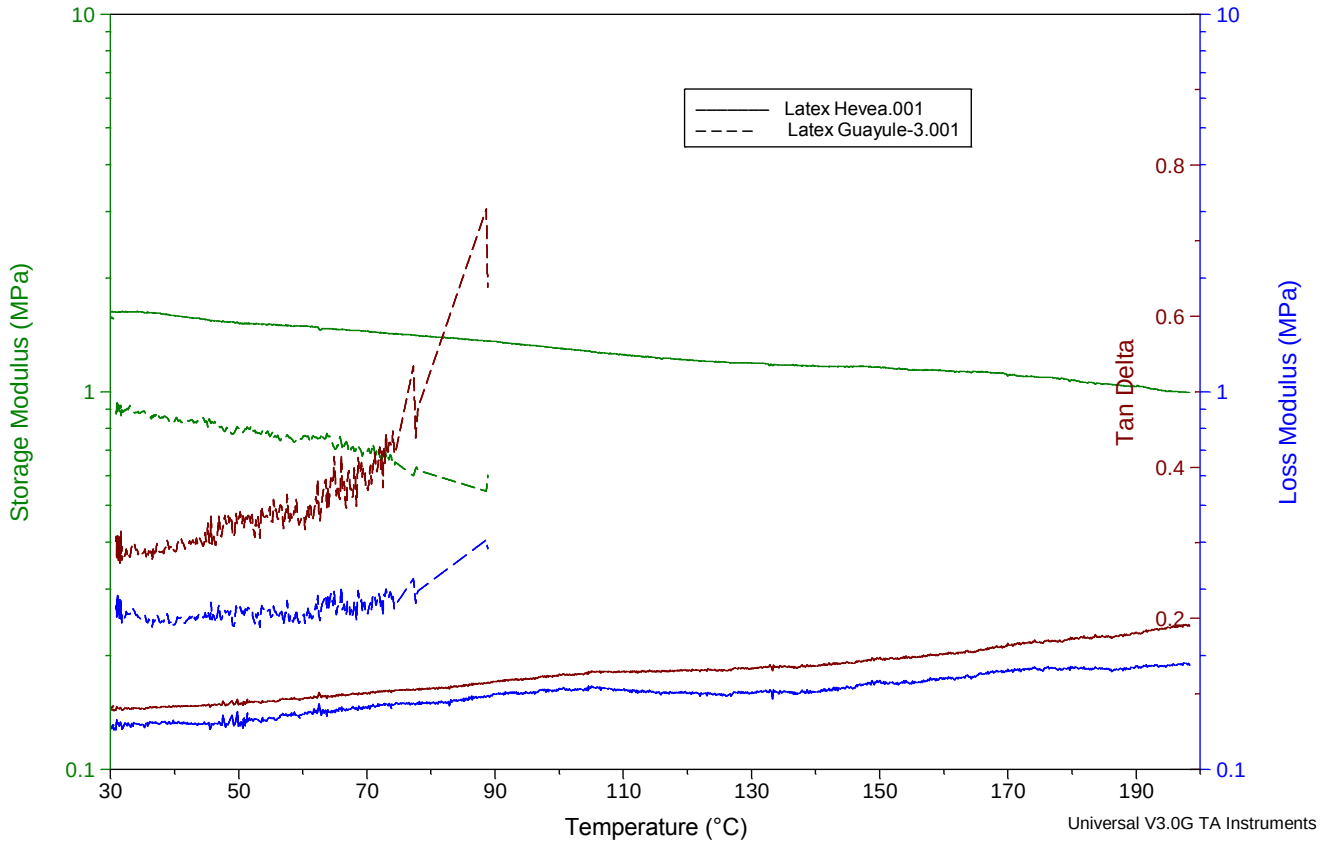
drying process

No additive, no vulcanisation

DRY CHARACTERISATION-STRAIN



DRY CHARACTERISATION- LINEAR DOMAIN



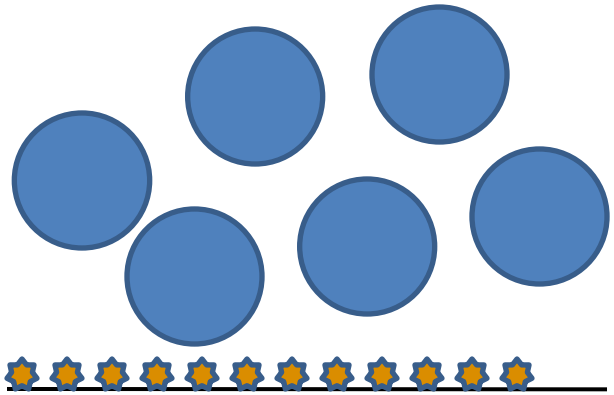
- **HEVEA film behaves like a "solid" film as far as 200°C**
- **GUAYULE film behaves like a "liquid" film since 100°C**

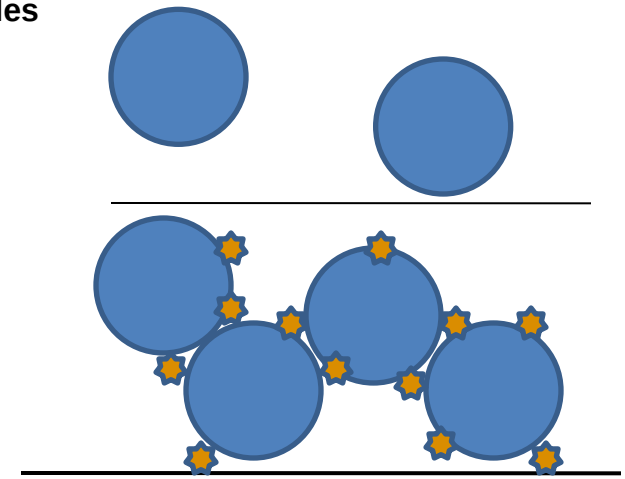
Very different dry characteristics

GLOVES PRODUCTION

1. coagulant surface treatment
2. latex surface coagulation
3. compaction

free particles





Coagulant surface treated

coagulated particles

surface coagulation process

with additives and vulcanisation

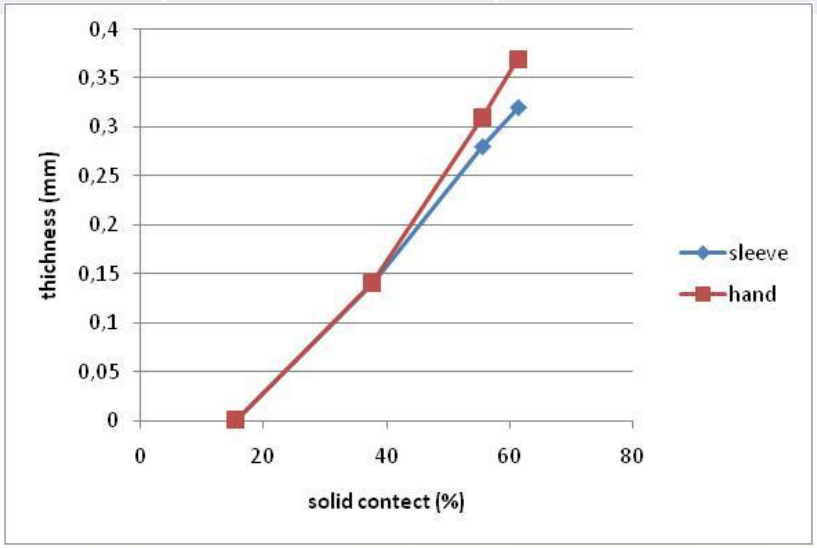
GLOVES PRODUCTION

quality progress after formulation and process adaptations

GLOVES PROPERTIES

	HEVEA LATEX	COMMERCIAL GUAYULE LATEX	EU-PEARLS GUAYULE LP LATEX	EU-PEARLS GUAYULE HP LATEX
Solid content (%)	**61.4**	**55.6**	**37.7**	**15.5**
Sleeve thickness (mm)	**0.32**	**0.28**	**0.14**	**-**
Hand thickness (mm)	**0.37**	**0.31**	**0.14**	**-**

GUAYULE ≈ HEVEA gloves thickness if solid contents (DRC) are the same



GLOVES PROPERTIES

	HEVEA LATEX	COMMERCIAL GUAYULE LATEX	EU-PEARLS GUAYULE LP LATEX	EU-PEARLS GUAYULE HP LATEX
Vulcanising dispersion ratio	27	54	54	54
Stress at break (Mpa)	17	7.0	13.3	-
Strain at break (%)	810	860	808	-

GUAYULE and HEVEA gloves mechanical properties are similar after slight formulation and process adaptations

Analysis of protein extracts from films and gloves produced with hevea and guayule latex

C. MOURTON-GILLES, M. DANIAU, G. OLIVIER	ANSM
A. SOUVERAIN, S.PALU, D. PIOCH, E. TARDAN	CIRAD
M.ROSSIGNOL, S.HEM	INRA-Protéome





ansm
Agence nationale de sécurité du médicament et des produits de santé

Scientific context

Latex allergy is due to the présence of hevea proteins in rubber goods (cleaning gloves, nipples, toys,…) and medical devices (gloves, catheter, syringe,…).

Latex allergy is a real health problem

Up to 17% of health care workers suffer from type I hevea allergy
Up to 16% of intra-operative shock are due to this allergy
Presence of cross allergy with some fruits (banana, kiwi,…)

A solution to this problem could be to develop devices with a non allergenic latex : **GUAYULE LATEX**

Objective

Collaborative study between CIRAD and National Health product Agency
To compare protein content of Guayule and Hevea device extracts

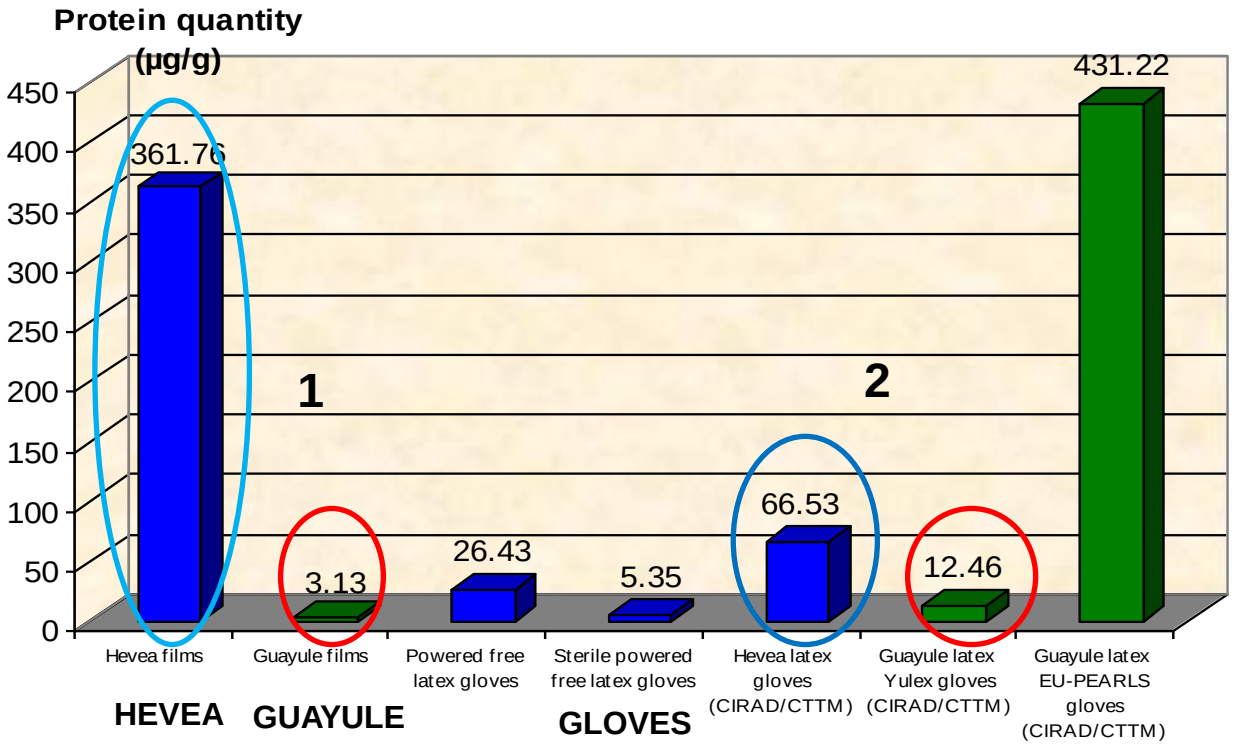
DETERMINATION PROTEINS CONTENT ON FILMS AND GLOVES EXTRACT

-Extraction of proteins

AFNOR EN 453-3 Modified

-Dosage proteins

Lowry Kit Biorad DC

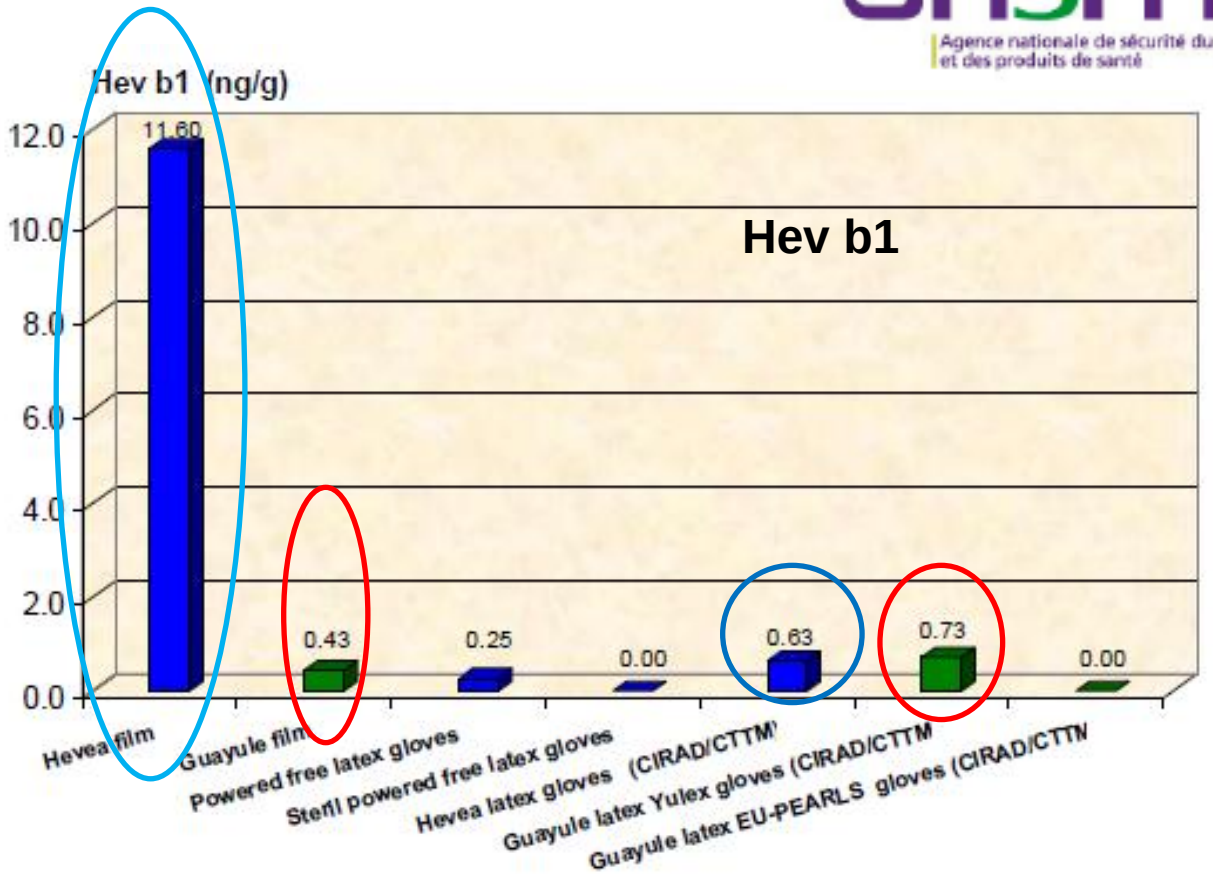


- **Proteins quantity in guayule films are 115 times lower than in hevea films and 9 times than in medical gloves (1)**
- **Gloves made with commercial guayule latex contain less proteins than hevea prototype gloves (2)**

Commercial guayule latex was provided by YULEX for the EU- PEARLS project

DETERMINATION OF ALLERGENS CONTENT FILMS AND GLOVES

-Dosage of allergens
Elisa sandwich
FITKit ICOSAGEN
(Acm, ABTS)



- **Allergen Hevb1 is present in the hevea films but in small amount in guayule extracts from films and gloves**

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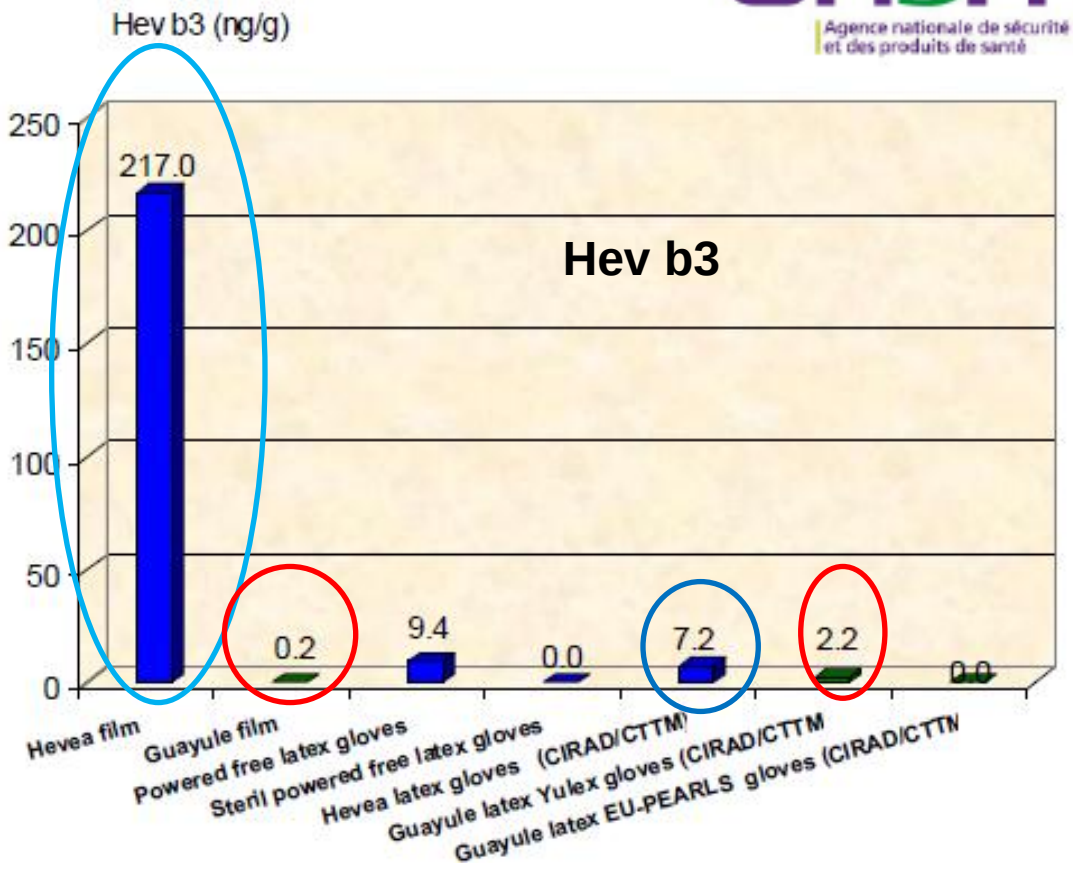
DETERMINATION OF ALLERGENS CONTENT FILMS AND GLOVES

-Dosage of allergens
Elisa sandwich
FITKit ICOSAGEN
(Acm, ABTS)

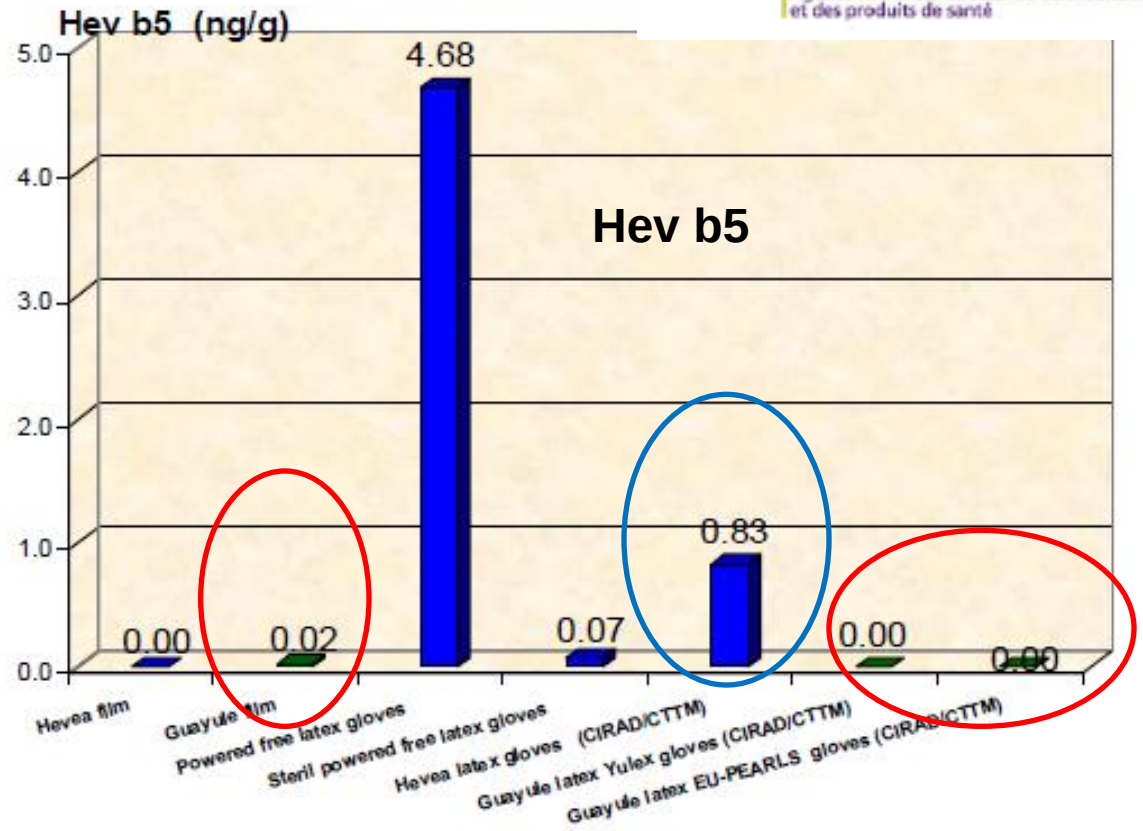


- **Allergen Hevb 3 is present in the hevea films and in small amount in medical and guayule gloves made with commercial latex**

Commercial guayule latex was provided by YULEX for the EU- PEARLS project

DETERMINATION OF ALLERGENS CONTENT FILMS AND GLOVES

-Dosage of allergens
Elisa sandwich
FITKit ICOSAGEN
(Acm, ABTS)

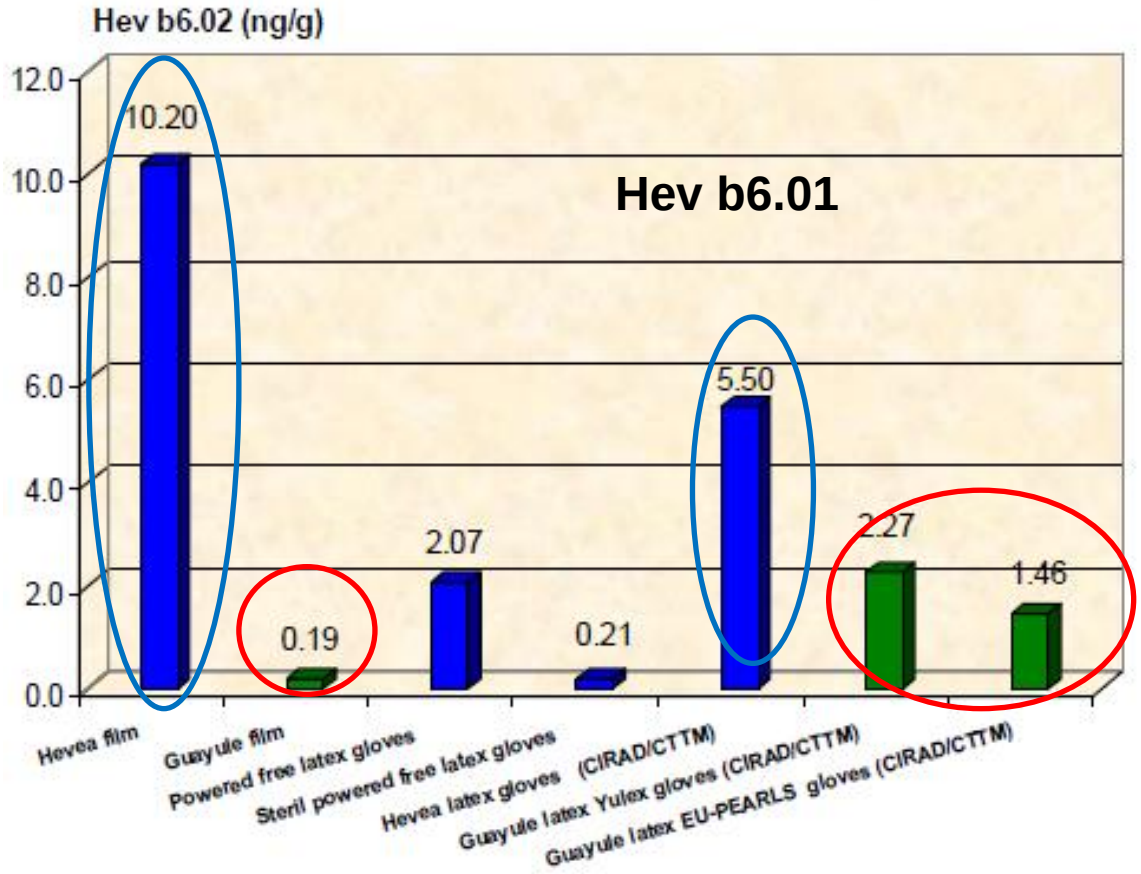


- **Allergen Hevb 5 is present in the hevea films**

Commercial guayule latex was provided by YULEX for the EU- PEARLS project

DETERMINATION OF ALLERGENS CONTENT FILMS AND GLOVES

-Dosage of allergens
Elisa sandwich
FitKit ICOSAGEN
(Acm, ABTS)



- **Allergen Hevb 6.01 is present in the hevea films but also in guayule gloves film in smaller quantity**

Commercial guayule latex was provided by YULEX for the EU- PEARLS project

Identification of proteins in guayule films extracts

Using Western Block and labelling with anti-hevea Mabs (Hevb1,Hevb3,Hevb5 and Hevb6.02) and using LC ESI MS/MS mass spectrometry with INRA:

- **Some hevea allergens were identified in guayule films**
  - **-Rubber elongation factor Hevb1**
  - **-Glucan endo1,3 beta glucosidase: Hev b2**
  - **-Hevamin A : Hev b14**
  - **-Pro-Hevein: Hev b6.01**

- **Proteins in guayule films extracts, Hevb1 and Hevb6.01 were detected.**
- **Allergen Hevb 6.01 is present in hevea films and gloves but also in guayule film and gloves**
- **Protein quantity in guayule films is about 100 times lower than in hevea films**
- **Only Hevb1 and Hevb6.01 were detected in guayule films using Fit Kits**

CONCLUSIONS

- **For wet characterization, HEVEA and GUAYULE latex are very similar,**
- **For dry characterization, HEVEA latex behaves as “solid” film , GUAYULE latex as “liquid” film. With higher molar mass (Mw) of the polyisoprene, GUAYULE films have similar or even better behavior than HEVEA films.**
- **For gloves production, slight formulation and process adaptations bring close mechanical properties and process behaviors for both latex.**
- **Preliminary results on latex allergenic of Hevea & Guayule latex, show that proteins concentration of guayule film is 100 fold lower than for HL film.**
- **Guayule latex has a lower content of allergenic proteins than Hevea latex.**
- **Guayule latex is an alternative source very useful in medical applications to avoid allergenic reactions of patients for Type I latex allergy**

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

ansm
Agence nationale de sécurité du médicament et des produits de santé

PIERCAN

EU-PEARLS FP7

CTTM
CENTRE DE TRANSFERT DE TECHNOLOGIE DU MANS

THANK YOU